KNOWLEDGE-BASED OPERATIONS:
The "So What" of Information Warfare

A Monograph
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ABSTRACT

KNOWLEDGE-BASED OPERATIONS: THE "SO WHAT" OF INFORMATION WARFARE by Major Samuel A. Guthrie, USA, 38 pages.

After publishing the Army's centerpiece doctrinal manual FM100-5 *Operations* in June 1993, the Army lived up to its assertion that intellectual change leads physical change and immediately began working on its vision of future joint military operations. This vision, referred to as *Force XXI Operations*, lays a conceptual foundation for military operations in the 21st century. This monograph explores a part of the future vision referred to as *Knowledge-Based Operations*.
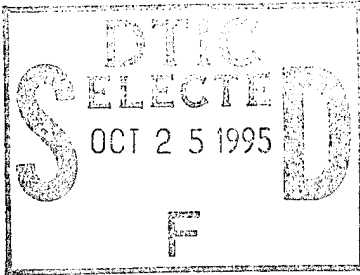
Battlefield frameworks have evolved over time providing a useful construct to guide preparation for the nation's next war. TRADOC Pamphlet 525-5 introduces a knowledge-based battlefield framework. This framework promotes the battle commander's ability to visualize the employment of forces and resources to dominate operational tempo. Within this framework the US Army proposes to achieve a decisive edge through the conduct of *Knowledge-Based Operations*.

This monograph traces the evolution in battlefield frameworks, descrives the knowledge-based framework, and presents a concept for *Knowledge-Based Operations*. This concept is the heart of the monograph. The potential impacts of the new framework and *Knowledge-Based Operations* on campaign and joint operations planning are discussed and conclusions are presented. Elements of the battle dynamics are used for evaluation criteria throughout.

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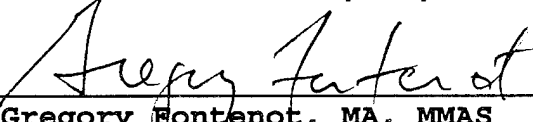# SCHOOL OF ADVANCED MILITARY STUDIES

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CHAPTER 1

INTRODUCTION

After publishing the Army's centerpiece doctrinal manual FM100-5 *Operations* in June 1993, the Army lived up to its assertion that intellectual change leads physical change and immediately began working on its vision of future joint military operations. This vision, referred to as *Force XXI Operations*, lays a conceptual foundation for both war and operations other than war for the early part of the 21st century. It was published in August of 1994. Although not a doctrinal publication, TRADOC Pamphlet 525-5 represents a dedication on the part of the United States Army to avoid becoming institutionally comfortable and complacent, awaiting defeat by a more determined foe. Constantly willing to challenge itself, the Army's leadership contemplates future warfare as a basis for change. The authors of TRADOC Pamphlet 525-5 do not claim to be prophets of future warfare. In essence, what has been accomplished is to collate the ideas, concepts, and vision of the Army's leadership into a format for subsequent exploration. The challenge for the Army community is to join the intellectual debate, leading the main body to physical change in future doctrine. With this in mind, the purpose of this monograph is to explore one part of the future vision referred to as *Knowledge-Based Operations*.

Battlefield frameworks have evolved over time, providing a useful construct to guide preparation for the nation's next war. Referring back to the 1986 version of FM100-5, one finds a fixed battlefield framework focused on a clearly defined threat and prescriptive in nature -- a threat-based framework. With the collapse of the Soviet Union, the 1993 edition

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of FM100-5 adopted a more flexible, less prescriptive doctrine and a framework known as capability-based. The changing nature of the battlefield was reflected in a corresponding evolution in conceptual framework. Most recently, the explosion in technologies with military application in an increasingly unstable world gives rise to an ill-defined threat. Hence, descriptive rather than prescriptive doctrine is likely called for. The leverage necessary to ensure decisive victory with minimal casualties may require a new battlefield framework. TRADOC Pamphlet 525-5 introduces a knowledge-based framework. It is intended to respond to the decline in fixed threats and a desire to leverage technology. This framework promotes the battle commander's ability to visualize the employment of forces and resources to dominate operational tempo. This controlled manipulation of events is conducted using *Knowledge-Based Operations* within this new framework. *Knowledge-Based Operations* are heavily reliant on dominating the information environment and hence the link to Information Operations and Information Warfare is evident.

The proposed methodology divides the research into three major sections. The first section investigates the evolution of the battlefield framework. This section establishes the utility of the battlefield framework and its link to projected strategic environments. This link reveals an interesting relationship between the evolution of battlefield frameworks and strategic force development. The section concludes by offering a definition for a knowledge-based framework. While the explanation draws initially from the work documented in TRADOC Pamphlet 525-5, this research shapes and extends the characterization with independent

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thought. The second section presents a concept for *Knowledge-Based Operations* within the newly established framework. This concept is the heart of the monograph. Finally, the potential impacts of the new framework and *Knowledge-Based Operations* on campaign and joint operations planning are discussed and conclusions presented. Elements of the battle dynamics outlined in TRADOC Pamphlet 525-5 are used for evaluation criteria throughout.

As the Chief of Staff of the Army, General Gordon R. Sullivan and co-author Lieutenant Colonel Anthony M. Coroalles imply in their paper entitled "Seeing the Elephant," the challenge for the Army is two-fold. First, the Army must discern the dominant characteristics of future war and second, "guide our doctrinal, organizational, and procurement decisions" so as not to get them too wrong. A suggestion offered by Michael Howard.[1]

The current explosion in technology enables a new approach to military operations. This monograph articulates a new approach to military operations for the 21st century. To accomplish this, the monograph defines a knowledge-based battlefield framework, suggests a concept for *Knowledge-Based Operations* using that framework, and finally discusses potential impacts on campaign planning.

CHAPTER 2

THE BATTLEFIELD FRAMEWORK

This chapter establishes the meaning and utility of the *battlefield framework* in general and refines the definition for the knowledge-based framework alluded to in the August 1994 edition of TRADOC Pamphlet 525-5. The battlefield framework permeates the strategic, operational, and tactical levels of war relating strategy, doctrine, and technology. Parallel trends with strategic force development reveal this relationship.

The battlefield framework referred to here differs from the organization of deep, close, and rear or offensive and defensive frameworks associated with military tactics. Simply stated, the *battlefield framework* is a means for the battle commander to visualize the employment of forces and resources in terms of time, space, and purpose. It provides the commander "a way to visualize how he will employ his forces against the enemy."[2] A 1994 white paper on the subject describes it at the tactical level as a framework consisting of "four interrelated concepts: area of interest, battle space, area of operations, and a specific organization of the tactical battlefields." It is suggested here that at the strategic and operational levels it is a military construct along the lines of the work of the Soviet military theorist Mikhail Tykhachevskiy. In a lecture entitled <u>Voprosv sovremennoy strategii</u> (Problems in Contemporary Strategy) Tukhachevskiy said:

> We can see throughout all history how the forms of
> war, armed forces, the methods of conducting war,
> operations, etc. are constantly changing in measure as
> the productive forces and social relationships
> change...In general, the nature of the war changes
> depending on the era, and depending on the state of
> social development which prevails in a particular
> country.[3]

To isolate the way in which commanders envision employing forces and resources from overarching operational and strategic considerations oversimplifies the impact of the issue.

An understanding of the battlefield framework is derived using the evolution of strategic environments. An analysis of the Cold War to Post Cold War evolution was conducted using four factors. These factors constitute the significant variables in establishing strategic influences on an appropriate battlefield framework. The factors are: the nation's requirement for use of its military forces; the strategic environment; the relative importance of the military form of power; and technology. The analysis establishes a common understanding of the battlefield framework and its relationship to strategic issues. Discussion regarding this evolution provides relevance for defining future frameworks. As will be shown, U.S. Army strategic force development strategies used to establish force structure requirements coincide with changes in the battlefield framework.

The Cold War : A Threat-based Framework

During the Cold War era the U.S. Army relied on a threat-based approach. United States national strategy focused on the containment of communist expansion.[4] The strategic environment was lethal yet stable.

Two nuclear capable super powers provided stability manifested in a bipolar world. The Soviet Union provided a monolithic threat that dominated the strategic attention of the United States. For the United States Army it became the driving force in the development of doctrine and forces.

The United States' requirement for military forces was dominated by the potential for conflict with Warsaw Pact forces in the European theater. It was believed that a force and doctrine designed to counter this specific threat would suffice for all other military needs of the nation. Lesser conflicts such as Southeast Asia, Southwest Asia, Northeast Asia, Counter Insurgency, Latin America and Nation Building were only relevant as they contributed to inducing or thwarting a U.S.-Soviet confrontation.[5] The unitary Soviet threat is testified to repeatedly at the conclusion of the Cold War era.

> ...our focus was on the deterrence and containment of Soviet power and influence, with relatively large forward-deployed forces and a clear orientation to protecting national interests in Europe.[6]

Over time, Cold War defense budgets became increasingly robust. A professional standing Army numbering in excess of seven hundred and eighty thousand soldiers was considered affordable in the 1980's. Funding for modernization initiatives was forthcoming. While the Soviets pursued a quantitative advantage, the United States sought a qualitative superiority.[7] Both nations fielded industrial age armies.

From the environment of the Cold War emerged a threat-based approach to military force structuring and commensurate battlefield

framework. Threat-based strategic force structuring optimized the force against a single, well defined enemy in a predetermined geographical location. Similarly, a threat-based battlefield framework emerged under this same logic. Variations of the framework were allowed in other theaters as deemed necessary, but they would have to rely on existing doctrine and forces.[8] Vietnam is an example that reveals how difficult variation was in practice.

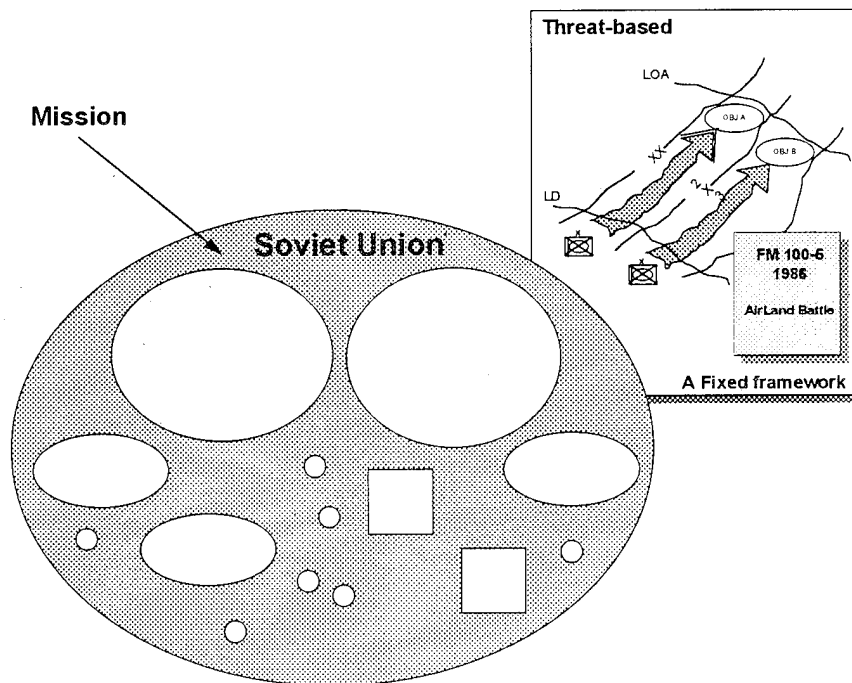A visual construct is offered at Figure 1.

Figure 1   A "Threat Based" Approach

The darkened portion of the schematic represents the "threat" or "mission" against which strategic force structuring was based. The white shapes on the interior represent other valid threats or missions such as regional contingencies. The choice of threat influenced both doctrine and material development initiatives.

The battlefield framework that evolved during this period relied on the same single preeminent threat with known doctrine and capabilities. Under this threat-based framework, the commander visualized the way he employed his forces and allocated his resources to counter deterministic presentation rates of echeloned forces using Soviet doctrine. The problem was clearly formulated. The difficulty was in fighting outnumbered.

Post Cold War : A Capability-based Framework

The Post Cold War era is associated with a capability-based approach. This period embraced a change in U.S. national strategy induced by the collapse of the Soviet Union and subsequent disintegration of bipolar stability. As the monolithic enemy dissipated, security issues became more difficult to quantify. Ethnic conflicts and weapons proliferation accelerated. In comparison, Cold War problems and solutions seem relatively manageable. The situation in Europe is illustrative of the change.

> The ability to determine the capabilities required of a
> future U.S. forward presence in Europe is complicated
> further by the perceived absence of a significant threat.
> In the past, U.S. forward presence was easily defined
> against a distinct and measurable threat. That no
> longer exists, and, while "instability" in a generic sense
> may pose risks, it does not lend itself to detailed
> threat-based force planning.[9]

The impending changes to strategic force structuring in the Post Cold War era is clearly evidenced by changes in our approach to resolving U.S. concerns in Europe.

The basis for the future U.S. forward presence cannot, therefore, be focused solely on potential threats. Instead, analysis must look beyond the search for the "right" number of U.S. personnel and concentrate on the capabilities needed to ensure the ability to execute effective military operations, if required.[10]

Once again we witness a strategic approach that parallels the impending battlefield framework.

The 1994 National Security Strategy (NSS) proposed a strategy of enlargement and engagement. The supporting National Military Strategy (NMS) characterized the new threat as unknown and uncertain.[11] The shift from the Cold War era fixation on Soviet expansionism to concerns over America's economic revitalization, regional instability, the spread of weapons of mass destruction (WMD), violent extremists, and various transnational phenomenon, shapes the nation's use of military forces in pursuit of national objectives. The specific requirements that emerge are: defeating aggression in two nearly simultaneous major regional conflicts, combating the spread and use of WMD, peace operations to support democracy and conflict resolution, as well as humanitarian and disaster relief efforts.[12]

The strategic environment becomes multipolar and is characterized by a variety of regional contingencies and new geopolitical fault lines.[13] Regional instability, uneven economic development, terrorism, drug-based economies, wanton criminal behavior, and environmental degradation produce a variety of challenges. The unitary Soviet threat is replaced by a menu of ambiguous combinations of threats to U.S. national interests. Meanwhile, U.S. military expenditures sink to 4.1 percent of the

Gross National Product in 1995. The Army's 1994 Posture Statement asserted that "changing national priorities have changed our military posture."[14] A Cold War dividend is expected and sought.

While there have been vast changes in technology, fundamentally the United States economy, society, and military remained industrial age. Industrial age technology and processes continue to influence solution strategies in all three areas. Technological improvements during the period begin to show remarkable promise for change, specifically in the area of automation. The commercial sector in particular demonstrates that demands of the 21st century require new approaches to age old problems.

The transition from threat-based to capability-based frameworks addressed the new menu of threats. Figure 2 provides the conceptual Illustration.
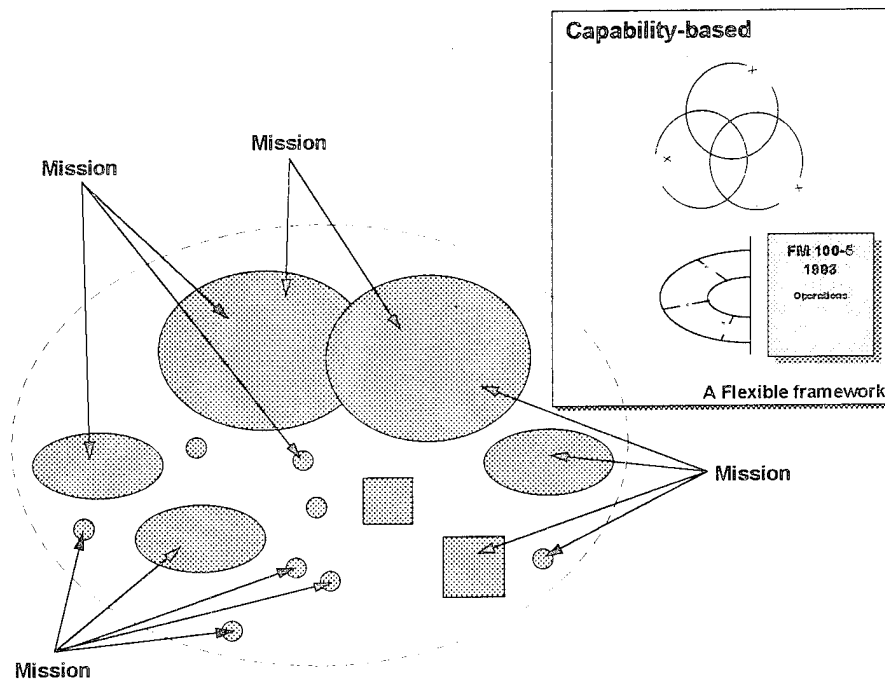

Figure 2   A "Capabilities Based" Approach

Optimization against a unitary threat was no longer appropriate. An overarching approach to strategic force development had to address a menu of threat combinations. In addition, reductions in fiscal expenditures in the Department of Defense necessarily influenced any solution. Single focus forces were no longer affordable. Clearly units would need to be prepared for a wider variety of missions and geographic orientations. The strategic question became what capability must be maintained in terms of forces to address the more diverse requirement. The capability-based battlefield framework attempted to resolve these same issues. The way a commander envisions the employment of his forces and resources must focus on a capabilities calculus. Solutions based on presentation rates, echelons, and Soviet doctrine were inadequate.

Lastly, the Post Cold War Army remained a predominantly industrial age force. The intent was to adopt an approach that would produce something other than "a smaller Cold War Army." While it is certainly outside the scope of this paper to prove, the preponderance of evidence reviewed suggests that the capability-based approach has not yet been able to achieve this.

An important finding can be made at this point in the research. To eliminate the long standing confusion over differentiating between threat and capabilities based approaches. In the final analysis, all strategic force structuring and battlefield frameworks are "threat-based," or more appropriately "mission-based." With regards to strategic force structuring, the Army must carry out its Title 10 responsibilities and produce a trained

and ready Army. The composition of the Army is ultimately determined by a set of perceived threats or mission requirements.

At no time during the course of this research did there appear any evidence that war would not remain a human endeavor and a bloody contest of wills. The conclusions simply detail a new battlefield framework, and later a method of operation, for destroying the enemy's will to resist, to include killing its soldiers. The concepts developed are intended to be highly effective and highly lethal. They will impose human suffering and destruction as have all means of waging war throughout history. This should be viewed as a continuation of the search for more efficient ways and means to prosecute war, not an attempt to change its very nature. In his book On War, Carl Von Clausewitz spoke to the issue in the following way:

> Kind-hearted people might of course think there was
> some ingenious way to disarm or defeat an enemy
> without too much bloodshed, and might imagine this is
> the true goal of the art of war. Pleasant as it sounds, it
> is a fallacy that must be exposed: war is such a
> dangerous business that the mistakes which come
> from kindness are the very worst. The maximum use
> of force is in no way incompatible with the
> simultaneous use of the intellect.[15]

Author's frequently add to the confusion surrounding new concepts regarding forms of war such as Knowledge and Information Warfare. Otherwise magnificent thoughts are neutralized by redefining the problem at hand. This is a typical pitfall when applying technology to real world problems. The "I'll solve the problem I can solve, not the one you have" syndrome. The predominate problem for the United States military is to

compel and deter those who would oppose the will of the United States and if unsuccessful, render them incapable of physical resistance.

The 21st Century: A Knowledge-based Framework

The Army must respond to calls ranging from humanitarian assistance, through regional war, to general war. The perceived threat, or mission, continues to shift from a finite set of combinations of MRCs (Major Regional Contingencies), LRCs (Lesser Regional Contingencies) and OOTW (Operations Other Than War). Figure 3 completes the conceptual model by depicting the emerging problem setting.
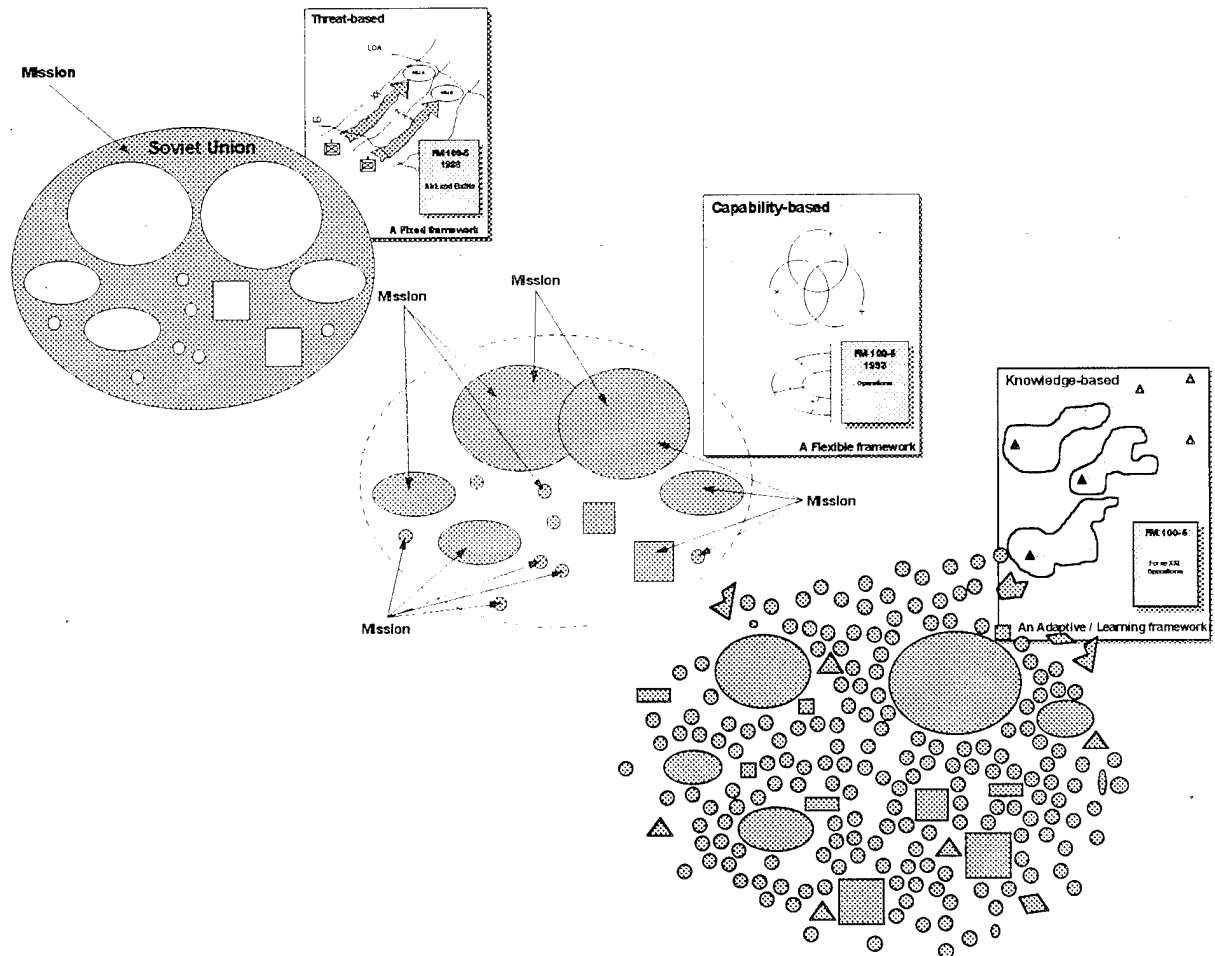

Figure 3   The Evolution of the "The Mission"

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The new era ushers in complexities that expand beyond the familiar boundaries of the "Soviet solution." Moreover, determining a fixed combination of missions and capabilities over any significant time horizon is questionable.[16] The challenge for the future is to establish the nature of the environment and its impact on missions over time. The Force XXI process is characteristic of a modern approach that addresses this challenge.

The strategic objective for Force XXI is established in a document published 15 January 1995.

> Transform the force from an Industrial Age Army to a knowledge and capabilities-based, Power Projection Army capable of land force dominance across the continuum of 21st century military operations, by leveraging information technology to advantage the Army's quality people, and by redesigning the fighting forces and the Army's sustaining base to better support these forces.[17]

Force XXI is envisioned as a "succession of qualitatively improved versions than as a single, fixed entity."[18] This description distinguishes Force XXI from previous modernization and reorganization efforts. Force XXI is a continuous modernization process unlike the ROAD, Division 86, or Army of Excellence (AOE) redesign efforts that focused primarily on modernizing the divisional structures of the Army. It defines an approach by which the Army maintains relevancy to the requirements of the strategic environment over time. In a sense it is an acceptance of an uncertain future. Rather than assert detailed long range projections of future threats to drive an industrial age journey down the road of conventional force development, it relies on process development and

adaptability to uncertain future conditions. It asserts that quality soldiers and battle commanders are the key to future success in this environment.

In the absence of a clearly defined threat, an appropriate battlefield framework must provide the commander with the ability to dominate the operational tempo through real time intelligence, real time learning, rapid force organization and enhanced situational awareness. This constitutes a knowledge-based approach. This has always been preferable but not technologically or institutionally feasible.

This new framework is based on the ability to observe, orient, decide, and act in real time in order to manipulate the tempo of operations at the battle commander's will.[19] The knowledge-based framework places a premium on positioning and protection of the force. Maneuver may involve less physical movement on the battlefield. It will become more a function of creating organizational relationships in real time to execute missions within minutes to seize opportunities that unfold before subordinate battle commanders. These opportunities are identified through reasoning over information and data affording a previously inconceivable battlespace awareness and operational tempo.

Reasoning over vast amounts of information and data is at the heart of the framework. Doctrinal templates used in the IPB process are illustrative. In the future, situational awareness will require the ability to characterize the opposition, establish tendencies and weaknesses, adapt, decide, communicate, and execute to exploit situations in real time. Cold War doctrinal templates were detailed and readily available. Plans were developed and practiced regularly over many years to ensure victory. Future challenges for the U.S. military are not adequately addressed by

such an approach. The information age brings tools that allow us to evolve to a new approach.

> Not only will we be able to generate greater combat power with a given force, but we will have the inherent organizational agility and versatility to respond to the increasingly broader range of missions our Nation requires us to perform, often on very short notice.[20]

Identifying and seizing opportunity have long been key to victory in warfare. These are yet more constants with the past. The force's ability to respond to short windows of opportunity has improved. Past frameworks had to facilitate the time-consuming processes of industrial age organizations and hierarchical command and control structures that made reaction cumbersome. Knowledge regarding ones own forces, the enemy, their interaction, and the environment aide in decision and control providing the nexus of a knowledge-based framework.

This framework does not rely on the luxury of predictability. It demands real time solutions. It implies a construct enabling the battle commander to manipulate the tempo of operations through the application of machine assisted reasoning. This will permeate the way in which operational and tactical level commanders apply their units and resources. Frameworks that use predilection as a crutch necessarily forfeit the decisive nature of manipulating operational tempo at will.

The knowledge-based framework addresses the problems of the 21st century by harnessing the Army's corporate knowledge. The framework unleashes the power of the battle command and battlespace doctrinal concepts. The framework focuses on establishing and

maintaining a solid "battle stance,"[21] fighting for information to build situational awareness, and ultimately applying reason to achieve real time solutions throughout operations. We will continue to hold fast to mission type orders, commander's intent, and endstate.

This new battlefield framework has another important aspect. It discards the notion that "if we look just a little longer," or just a little harder we can determine what our next enemy looks like as we begin our industrial age preparations to counter him using old frameworks. This is a myth for the United States Army of the 21st century.

At the strategic level, the approach makes the U.S. military relevant to the era in which it will serve. It relates the Army's DTLOMS (Doctrine, Training, Leadership, Organizations, and Soldier system) to national and military strategies for the era. At the tactical level, the new battlefield framework provides a means to visualize how a commander will employ his 21st century forces in a decisive fashion through manipulation of the operational tempo.[22]

CHAPTER 3
KNOWLEDGE-BASED OPERATIONS

The purpose of this chapter is to offer a specific concept for *Knowledge-Based Operations* (KBO) in the 21st century. The description is specific with regard to the concept and utility, but not to systems that enable it. In this regard, the concept serves as a requirement statement. The chapter attempts to bring the concept to life and ultimately communicate a vision for *Knowledge-Based Operations* that goes beyond shared situational awareness. It intends to reveal *Knowledge-Based Operations* as the "so what" of Information Warfare.

Knowledge-Based Operations: A Definition

Decisive victory in the 21st century is achieved through massive reasoning over information and data to achieve decision and take action. The enhanced ability to decide and act in response to opportunity in real time is paramount to dominating the operational tempo. *Knowledge-Based Operations* are characterized by the performance of military actions at a controlled rate, often in surges. They are based on the application of machine assisted and human reasoning to achieve understanding and decision, disseminate orders and intent, organize capabilities, and mass effects in real time.

Knowledge-Based Operations enable battle commanders to exploit unforeseen opportunity on the battlefield rather than relying on an ability to predict its appearance. Front-line battle commanders create and identify opportunity in concert with their higher commander's intent. The

decisive advantage of *Knowledge-Based Operations* is the battle commander's ability to seize opportunity that was previously too fleeting.

Knowledge-Based Operations are predetermined in objective only. The nature of this form of operation is that force is poised to strike rapidly in real time as opportunities are created. Then just as quickly, it recoils back to the ready position. Speed is a function of the ability to reason over vast amounts of information and act before the window of opportunity closes. The strike and recoil are functions of a relative common picture and the massing of effects rather than forces wherever possible. Under this description of *Knowledge-Based Operations*, the effects of the force are like those of a rattle snake in the short term and a boa constrictor in the long term -- potentially lethal with each blow, but cumulatively suffocating regardless.

More Than Situational Awareness

Throughout history information and knowledge have been critical to the conduct of military operations. Some 25 centuries ago, Sun Tzu presented their military significance. "If you know the enemy and know yourself, you need not fear the result of a hundred battles."[23] The importance of information and knowledge with regard to military matters is due to their close relationship with decision. In military operations, information and situational awareness are important only as they contribute to decision and subsequent action. Decisions are made by reasoning over data and information. Reasoning is based on knowledge. This paper suggests that *Knowledge-Based Operations* establish the relevance of Information Operations and Information Warfare in the conduct of military operations by relating them to decision and action. For

information to be relevant one must be able to exploit it in a way that facilitates action. Short of this, information and situational awareness are meaningless in military operations.

Situational awareness is critical to *Knowledge-Based Operations*. It establishes the conditions that systems, soldiers, and battle commanders must reason over. In <u>Thoughts for Joint Commanders</u>, Lieutenant General (Ret) Cushman wrote:

> Like tactical commanders, the joint force commander
> should strive to develop what is best described by
> another term from German doctrine: fingerspitzen-
> gefuehl, or "fingertip touch" -- an acute hands-on
> sensing of the moving situation as it lies out there on
> the ground, together with the situation's risks and
> opportunities, that leads almost by inspection to the
> right action. He strives also to shape the battle so that
> it goes his way, thereby increasing the certainty of his
> battle picture.[24]

Any definition of *Knowledge-Based Operations* that ends with Situational Awareness (SA) or Relative Common Picture (RCP) is grossly inadequate for the complexities that face the modern battle commander. An example from the Navy illustrates the relationship between situational awareness, the application of reason, decision, and action in a high tempo environment.

The captain of an AEGIS Cruiser would be wholly incapable of protecting the fleet if his method of operation ended with situational awareness. Facing multiple supersonic missiles aimed at numerous ships in the fleet with varying degrees of importance, the captain relies on human and machine assisted reasoning to decide and act. The tempo of

operations quickly exceeds the human capacity to make all decisions in a reliable fashion. The doctrine statements of the AEGIS, which are certified and reviewed by the captain, allow him to focus his human reasoning where machines are wholly inadequate.[25] Without this combination of human and machine assisted reasoning, situational awareness is nothing more than notification of impending disaster. The concept of *Knowledge-Based Operations* as defined earlier in this paper is more than enhanced situational awareness. It is enhanced situational awareness that enables action made relevant through the application of machine assisted and human reasoning.

Knowledge-Based Operations require reasoning over data and information at a low level of cognition by machines, at higher levels by staffs, and at the highest level by battle commanders. Reasoning that establishes how long an attack helicopter battalion can remain on station in support of a specific mission given parameters such as altitude, weather conditions, and various combinations of external fuel and weapons pods, is at the lower end of the spectrum. The high end deals with the deceit of war, the deliberate inefficiencies introduced to avoid predictability, and the *coup d' oeil* of the battle commander. Machine assisted reasoning is necessary to free up soldiers, staffs, and battle commanders to focus on problems requiring higher levels of cognition in the high tempo, highly uncertain, complex environment of future warfare.

The form of operations espoused here is offered in full recognition of the futility of searching for perfect information and certainty. It seeks to increase the flexibility of the commander to master the tempo of operations by facilitating his exploitation of real time information and

opportunity. Emphasis placed on deciding and acting mitigates the temptation to violate the *point of diminishing returns* with regard to information. *Knowledge-Based Operations* provide relevance to the Information War and guides us to fight over the right information -- information that can be transformed into decision and action. It suggests that *Knowledge-Based Operations* drive Information Operations focusing efforts by "knowing what to know."[26]

Knowing What to Know[27]

The great battle commanders throughout history have shown a remarkable ability to know what to know. While this kind of genius is not apparent in everyone, we can say that information arriving too late for decision and action is of no use to anyone. This is not new. However, it underscores the importance of knowledge in comparison to information. Information does not dominate operational tempo; actions do.

Knowledge is often distinguished into four types: objects, events, performance, and meta-knowledge.[28] A mechanized infantry brigade (object) conducts a deliberate attack (event) by fixing on the right with one battalion and conducting a two battalion single envelopment on the left (performance). The chance of success for this mission given the correlation of forces is greater than fifty-fifty (meta-knowledge). Meta-knowledge is literally "knowledge about knowledge." In a U.S. Army context, knowledge is found in doctrine, soldiers, staffs, and battle commanders.

Machine assisted and human reasoning based on doctrine, training, and experience, ultimately produces decision and action. The ability to do this rapidly enables the commander to seize opportunity not

previously exploitable. This transcends a definition for *Knowledge-Based Operations* that restricts itself to *enhanced situational awareness*.

Virtual Corporations: Real Profit

A new corporate model referred to as the *virtual corporation* has the business world standing on its head. It is a construct that makes corporations competitive in a rapidly changing, highly competitive marketplace. In essence, it does so by dominating the tempo of operations.

In their book The Virtual Corporation, Bill Davidow and Mike Malone present a concept that fundamentally alters the way a business makes decisions and organizes itself. It is a concept that diverges from mass production and asserts a new goal referred to as mass customization. It is a change in approach warranted by a rapidly changing, uncertain, and competitive marketplace.

Imagine a business under the old corporate paradigm. A high rise building in Chicago where the fourth floor is occupied by marketing, the fifth floor by sales, and the sixth is accounting. The strategy is mass production. The entire firm is optimized to generate and sell a specific line of products. Moreover, the line of products had to be determined well in advance to allow the bureaucracy and manufacturing process time to prepare, produce, and deliver.

In contrast, there is the *virtual corporation* -- a corporation where the product itself is determined by sales representatives on the front lines of the marketplace, or better yet, the customer. Current market demand drives the corporation, not the other way around. In a sense the virtual

corporation "thinks in reverse."[29] The corporation's nature is to respond where opportunity is created. It does not need to predetermine the market. The following example illustrates the way a virtual corporation might develop.

A sales team discovers a demand for a new product as a result of its daily contact with the customer market. The CEO and his staff receive information concerning the demand and examine it. They determine that the company should pursue the product line. The virtual corporation begins forming beginning with the sales team that uncovered the opportunity. A marketing firm in Orlando is chosen due to its world renowned reputation for products of this type. The company's own sales department in San Diego has handled similar products with great success so they are brought in on the project. They in turn suggest an accounting firm in Dallas. They have done business with them recently on a similar product and were very pleased with their work. Through the sales departments contacts they have already established that the firm is interested and could have a team available during the time required. A decision on suppliers and distributors can be made once the project is more developed.

The virtual corporation's measure of effectiveness is based on its ability to produce a desired effect at a greatly increased tempo. The effect is customer satisfaction. The virtual corporation gains nothing from overhead, impressive hierarchical organizational structures, or mass production of generic products. Its effectiveness is a function of mass customization to a wider and wider variety of demands. The trend is toward customization and away from mass production. Survival in the

21st century market place means determining demand at the source, then deciding, organizing, and acting to mass customize before opportunity fades.[30]

Virtual corporations are opportunistic. Companies, and departments within companies, come together quickly to exploit fast-changing opportunity. Arrangements are rarely permanent in nature. Once the desired effects have been achieved, the relationships dissolve or are modified to meet yet another opportunity that has emerged. It is an organizational concept on the hunt for opportunity.

Virtual Organizations: Real Effects

Military organizations conducting *Knowledge-Based Operations* function in much the same way. Utility is based on mastering the manipulation of operational tempo and producing massed effects at the will of the battle commander. Military organizations no longer measure worth in terms of size, infrastructure, or impressive hierarchical fixed organizational structures. The trend is toward massed effects not massed armies.

The concept underlying the virtual corporation is fundamental to the conduct *Knowledge-Based Operations*. The organizational innovations of the Air Force during the Gulf War are illustrative. During Operation Desert Storm, a series of informal arrangements and ad hoc groupings provided world class expertise and information processing to the theater battle commander. These organizations came from disparate locations, many of which were not even in theater.[31] Officers in the pentagon assisted with target selection and attack planning within hours.

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Weather information was processed by meteorologists in the United States. CENTAF's spare parts account was managed by a staff at Langley Air Force Base in Virginia. Space Command provided early warning of SCUD attacks to forces in Israel and Saudi Arabia from Cheyenne Mountain, Colorado.[32] The theater battle commander was afforded the effect of an elaborate staff, processing vast amounts of data and providing real time analysis without massed physical presence or predetermined organizational structure. The organization was tailored to specific command needs for the operation at hand, and in the spirit of the virtual corporation, dissolved after the war.

While the utility of a military force will be qualified by its ability to produce massed effects, robustness remains an essential characteristic in military operations. The ability to continue the fight remains a critical trait for military forces. However, robustness may be defined in terms of other than physical mass. If massed effects are the coin of the realm, then robustness is necessarily defined in terms of an ability to continue to produce massed effects. Since its conception, the army corps has been considered to be a robust organizational design. It has the capacity to withstand blows yet remain capable of regenerating combat power. Given the description of *Knowledge-Based Operations* provided in this paper, robustness may take on a new interpretation. Rather than the ability to regenerate physical mass, it may be the capacity to regenerate massed effects. Internetted command structures can reorganize relationships between unaffected units. Physical proximity is compensated for by the range of modern systems. Moreover, appropriate reorganization is established through machine assisted and human reasoning. New

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organizations are quickly formed to sustain the ability to mass effects simultaneously throughout the depth of the battlefield.

Battle Command in KBO

Battle command is the art of deciding, leading and motivating soldiers. Empowering the deciding function of battle command is at the heart of *Knowledge-Based Operations*. Decision under uncertainty has long been a commander's challenge. *Knowledge-Based Operations* do not eliminate uncertainty. They do, however, offer a solution to the long standing debate concerning the centralized and decentralized ways of coping with uncertainty.

Historically, the two ways are not considered opposed but rather perversely interlocked.[33] Raising the decision threshold to higher levels of battle command, and reducing the initiative and self-sufficiency of the subordinate commander necessarily reduces the subordinate's ability to deal with his own uncertainty. Increased certainty for the higher level battle commander is paid for by uncertainty at the lower levels. The great successes of the Roman legion, Napoleon's Grande Armee, Moltke's armies, and Ludendorff's storm detachments suggest that a higher commander's willingness to accept greater uncertainty and hence reducing it at lower levels is the superior form.

Under the proposed concept for *Knowledge-Based Operations* however, the proposition is no longer an either/or proposition. By design, *Knowledge-Based Operations* intend to exploit real time opportunity identified at any level. To do so, organizations can have no fixed relationship. Battle commanders are the centerpiece around which

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appropriate organizational arrangements are constructed in real time. Thus, senior battle commanders can exploit the initiative of numerous subordinate battle commanders in a controlled form of *Auftragstaktik*. The force changes shape from an organizational perspective to best manage uncertainty throughout the force.

Battlespace in KBO

Knowledge-Based Operations reconcile the battlespace concept, mission type orders, and methods of controlling and directing the force. The vision of "amoeba-like" battlespaces traversing the theater of operations guided by battle commander's executing mission type orders is initially unsettling. At issue is how one controls and directs subordinate efforts in a safe and synergistic manner in an apparent absence of conventional means for tactical control such as: unit boundaries, coordinating altitudes, FSCLs, RFLs, CFLs, axis' of advance, and objectives.

Amoeba-like forces and current conventional methods of tactical control are often seen as mutually exclusive. Regardless of the forces ability to "see the battlefield" in real time, control measures give subordinate forces their initial orientation to facilitate tactical planning. In execution, however, control measures may be unnecessarily restrictive to *Knowledge-Based Operations*. Hence, such measures can be altered in real time to enable the optimal employment of combat power within a commander's battlespace.

During execution, commanders seize real time opportunities that best serve the higher commander's intent. Control during execution is a

function of knowledge, not lines. The integrated initial plan serves simply to orient battle commanders. The initial set of control measures used for planning become a point of departure for real time adjustment. At execution, they become part of the shared knowledge and are highly pliable to facilitate exploitation of opportunity. Adjusting, eliminating, and deconflicting control measures occurs horizontally as well as vertically throughout the force to facilitate actions which serve the commander's intent.

Knowledge-Based Operations allow battle commanders to make effective use of combat power within their battlespace. This is most evident where battlespaces overlap. In the event that a high priority target of opportunity arises in this mutual area, current methods would resolve the issue in one of three ways: (1) the force responsible for the area would engage, possibly diluting combat power from other high priority efforts in his battlespace; (2) the force responsible for the area would not engage due to other higher priority efforts and the opportunity is lost or; (3) manually reestablish new control measures allowing the force with overlapping battlespace to engage, but possibly missing the fleeting opportunity. Knowledge-Based Operations deconflict the situation by reasoning over shared knowledge, unrestricted by lines on a map. If, for example, reasoning over situational awareness determines a fratricide potential exists, then units to engage are necessarily restricted. The engagement is not restricted due to the inability to effect timely coordination of actions. Options are evaluated and coordinated horizontally between peer forces, and vertically with higher commands in a way that maximizes effective application of combat power. The force to

seize the opportunity is determined by battle commanders unconstrained by lines on the ground. This is not to say that *Knowledge-Based Operations* eliminate the fog, friction, and chaos of war. Rather, this form of operations facilitates applying combat power at a significantly increased tempo in order to profit from real time opportunity.

Military domination in the early part of the 21st century means dictating the tempo of operations. *Knowledge-Based Operations* provide the battle commander with a form of operations that creates opportunity and seizes it. Battle commanders create organizations in real time and deliver massed effects.

The use of time and space in *Knowledge-Based Operations* are less predetermined. Fluid battlespaces are shaped and reshaped to engulf belligerent forces and dominate them at the will of the battle commanders. Control is synchronized in real time. The commander's ability to rapidly form organizations, coordinate, and mass effects, enables him to quickly seize his objective. The path unfolds before him through reasoning over information he has fought to obtain during Information Operations as well as opportunities uncovered by subordinate commanders. Information Warfare is not strictly a matter of electronics that would limit the theory to conflicts with symmetric opponents. It is the fight for any information that leads to situational awareness, decision, and action in the conduct of *Knowledge-Based Operations*.

CHAPTER 4

IMPACTS ON CAMPAIGN PLANNING

Campaign planning in early part of the 21st century must emphasize initial response and real time adaptability, and discount inherent reliance on predicting intermediate outcomes. Campaign planning and joint operations planning in general remain viable mechanisms for focusing efforts to accomplish strategic objectives. However, the joint force capable of *Knowledge-Based Operations* must be guided by a campaign plan that is equally opportunistic and manipulative of the operational tempo. To achieve this, campaign planning in the future must do two things. First, it must set the conditions for *Knowledge-Based Operations* by incorporating information operations early in the campaign. Secondly, it must accept crisis action planning under "no plan" as the norm and acknowledge the limitations of deliberate planning in future strategic environments.

Establishing Dominant Battlespace Awareness

Incorporating information warfare considerations into campaign planning establishes *Dominant Battlespace Awareness* (DBA) -- a state of being essential to the conduct of *Knowledge-Based Operations.*[34] Integrating an information dimension into campaign planning enables *Knowledge-Based Operations* in much the same way that integrating air operations and the air dimension enhances ground maneuver. Both establish favorable conditions for the force to dominate military operations in the pursuit of strategic objectives.

The nature of operations originated with the primacy of killing enemy soldiers. Beginning with World War II, the goal of battle transitioned from killing people, to destroying machines of war (and the people operating them).[35] The most recent stage of the development centers on information flow. The evolution in force dispersion -- the "empty battlefield" syndrome -- necessitates an increase in the flow of information.[36] Rapid concentration of forces at the decisive point followed by quick dispersion, mandates increased information flow. Students of Operation Just Cause and the Gulf War have no difficulty identifying how depriving an enemy of the ability to organize resistance facilitates decisive victory. While attacking and defending information flows are not new in the conduct of war, their relative importance in campaign planning is on the rise. The traditional division of military operations into "hitting and holding" may be altered by superior information to enable "hitting without holding."[37] Information Campaigns, as described by General Glen Otis and Dr Cherry, impact on campaign planning and facilitate a knowledge-based form of operations.[38]

The concept of information campaigns addresses the central role of information in the modern theater of operation. United States forces rely on information flow, from high tech to HUMINT, to command high tempo operations and apply decisive force. As such, ad hoc methods for securing informational high ground must not be relied upon. Planning and executing the information campaign "must become a central theme of readiness and modernization."[39]

Campaign planning must set conditions for battle commanders to reach and maintain the high level of cognition necessary to conduct

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Knowledge-Based Operations. By introducing information operations into campaign planning we "deny the threat the opportunity to successfully use information at the operational, tactical, or system-to-system level" and enable friendly joint forces to achieve *Dominant Battlespace Awareness* which facilitates the conduct of *Knowledge-Based Operations.*[40]

The level of cognition referred to as *Dominant Battlespace Awareness* consists of three essential elements.[41] The first is information about the battle commander's own forces. The second is a similar understanding of belligerent forces. The third element is knowledge of the complex relationships that affect both, to include their interaction. By obtaining these, friendly forces overwhelm the enemy's ability to effectively command and control in a manner consistent with the tempo set by friendly forces conducting *Knowledge-Based Operations.*[42]

Dominant Battlespace Awareness has varying degrees of fidelity based on the echelons of battle command and their respective battle calculus. Therefore, we may find it necessary to achieve DBA at various levels of command during various phases of a campaign. Even though highly internetted[43] organizations share situational awareness, campaign planning can focus information operations to achieve *Dominant Battlespace Awareness* at specific levels in concert with the overall campaign design. In Desert Storm, for example, one might have established a requirement for *Dominant Battlespace Awareness* at specific echelons prior to initiating the ground war. Campaign planning incorporates *Knowledge-Based Operations* by integrating measures to establish *Dominant Battlespace Awareness* early in the campaign design.

Mission Type Campaigns

The second change to campaign planning brings us back to the parallel drawn earlier between battlefield frameworks and the strategic processes used to determine army force requirements. Evolving joint doctrine asserts that campaign planning is compatible with both the peacetime deliberate planning and crisis action planning processes conducted under the Joint Operations Planning and Execution System (JOPES).⁴⁴ As joint doctrine on campaign planning emerges, it must embrace crisis action planning under "no plan" as the norm and dispose of predictive and prescriptive campaign planning procedures to the greatest extent possible.

Deliberate planning is essential to force development and other critical resourcing decisions. However the utility of campaign plans developed during deliberate planning is less certain. Campaign planning in conjunction with deliberate planning provides useful guidance for the development of supporting plans. This promotes resourcing decisions in peacetime. Nonetheless, the resulting campaigns have little potential to impact actual operational warfighting. Not even Operation Desert Storm adhered to a deliberate plan or preconceived campaign design. The concept of "off the shelf" plans is rendered obsolete by joint forces conducting *Knowledge-Based Operations* in the evolving strategic environment. With the advent of joint forces capable of *Knowledge-Based Operations* and the unexpected impact of successes and failures throughout the various levels of war, campaign planning doctrine must pursue the dynamic and adaptive characteristics of mission type orders. It is possible that campaign plans will cease to be viewed as a pre-

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planned series of sequential operations but rather become a sequence of operations capitalizing on opportunities enabled by superior knowledge and reasoning.[45]

CHAPTER 5

SUMMARY

This research suggests that maintaining the decisive edge in future strategic environments requires more than strapping new technologies onto industrial age forces. It requires a change in methods and mind set. In 1940 the chief of cavalry, Major General John K. Herr, took great pride in the fact that eight troopers could embark the squad's horses, fodder, machine guns and equipment in eight minutes.[46] The world is fortunate that General Chaffee and others recognized how unimpressed the panzer divisions rolling through Europe would be. Resistance to new forms of warfare may be explained in part by the following comment made at the dawn of mechanized warfare:

> Mechanization is a means to move men and guns more swiftly -- a headache-creating nuisance to the generals whose brains perforce must work more swiftly than of yore.
>
> > Norman MacMillan
> > British Army
> > 1938

Knowledge-Based Operations require battle commanders capable of disciplined thought and determination at even greater speeds.[47] This underscores the importance of future leader development and machine assisted reasoning at lower levels of cognition.

Amidst the torrent of projections concerning future conflict and the mesmerizing effect of the current explosion in technology, one must not lose sight of the primacy of decision and action in military operations.

This paper extends the meaning of *Knowledge-Based Operations* well beyond that of enhanced situational awareness.

Tracing the evolution of strategic force development and battlefield frameworks established their link to the strategic environment. The evolution reveals that the battlefield framework, the way that a battle commander envisions employing forces and allocating resources, permeates the strategic, operational, and tactical levels of war. The Force XXI approach and the proposed knowledge-based framework are offered as the logical continuation of this trend to address future conflicts involving military forces.

Knowledge-Based Operations allow the battle commander to manipulate the operational tempo through machine assisted and human reasoning over vast amounts of information and data. The enhanced ability to decide and act in response to real time opportunity is fundamental to *Knowledge-Based Operations*. A proper mix of machine assisted reasoning at low levels of cognition and human reasoning by battle commanders at the highest levels provide more than enhanced situational awareness. They provide rapid decision and action.

Knowledge-Based Operations exploit the concepts of battle command and battlespace. Battle command is exploited in what resembles a controlled form of *Auftragstaktik*. Under mission type orders, battle commanders pursue opportunity that can now be capitalized on by higher levels of command. In other words, from the higher commander's perspective, mission type orders are no longer a fire and forget proposition. This is reflected in the fact that the managing of uncertainty at high and low levels of command is no longer an either/or dilemma.

Knowledge-Based Operations have also been shown to reconcile the concept of battlespace with the need to control the force. Under Knowledge-Based Operations control measures are deconflicted in real time. This enables the optimal employment of combat power against fleeting opportunities on the battlefield.

Two effects of Knowledge-Based Operations on campaign planning were discussed. First, information warfare must be incorporated into campaign planning in order to achieve Dominant Battlespace Awareness. Dominant Battlespace Awareness sets the conditions for the conduct of Knowledge-Based Operations. The second impact on campaign planning suggests that crisis action planning under "no plan" may evolve as the standard model. Planning that relies on predictive and highly prescriptive procedures is increasingly irrelevant in the midst of virtually infinite combinations of scenarios and belligerents.

The U.S. Army has a decided advantage over other organizations when putting such a form of operations into practice -- our doctrine. The codification of institutional knowledge into doctrine, combined with training, leader development, organizations, material, and soldier systems is something that cannot be instantaneously copied or purchased in the international arms market. While the hot spots around the world harbor a mix of high tech, low tech, and industrial age forces, Knowledge-Based Operations provide the decisive edge in the 21st century.

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ENDNOTES

[1] Sullivan, Gordon R. and LTC Anthony Coroalles, "Seeing the Elephant: Change and America's Army." currently an unpublished paper, (Washington D.C.: Department of the Army, not dated) 1. The authors reference Michael Howard's dictum that in an age of peace, military institutions must seek to prevent from establishing doctrines that are "too badly wrong." Howard, Michael., "Military Science in an Age of Peace," RUSI Quarterly, March 1974, 7.

[2] U.S. Army, Field Manual 100-5, Operations. (Washington D.C.: Department of the Army, June 1993) 6-12.

[3] Tukhachevskiy, Mikhail. N., "Voprosv Sovremennov Strategii (Problems in Contemporary Strategy)," (Moscow: Voyennyy Vestnik Publishers, 1926) in New Problems in Warfare (Carlisle Barracks, PA: U.S. Army War College, 1983) 51.

[4] U.S. Security Strategies and Posture Statements, and their successor documents, have testified to this strategy over most of the post W.W.II Cold War era. Recent reference is made in the National Security Strategy of the United States, (Washington, D.C.: The White House, January 1988) 1-3.

[5] U.S. Army, The United States Army Posture Statement FY94. (Washington D.C.: Department of the Army, March 1994) 20.

[6] Ibid.

[7] Chairman of the Joint Chiefs of Staff, United States Military Posture for FY 1988, (Washington D.C.: Office of the Chairman of the Joint Chiefs of Staff, 1987) 10.

[8] U.S. Army, Field Manual 100-5, Operations, (Washington D.C.: Department of the Army, June 1993) 6-12.

[9] The authors discuss the particular dilemma of Post Cold War Europe. Due to the disintegration of a unitary threat, the need arises for determining capability not force counts. Johnsen, William T. and Thomas-Durell Young, Defining U.S. Forward Presence in Europe: Getting Past the Numbers, (Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, June 1992) 3.

[10] Johnsen, William T. and Thomas-Durell Young, <u>Defining U.S. Forward Precence in Europe: Getting Past the Numbers</u>, (Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, June 1992) 4.

[11] Chairman of the Joint Chiefs of Staff, <u>National Military Strategy of the United States, 1994</u>, (Washington D.C.: Office of the Chairman of the Joint Chiefs of Staff, January 1993) 4.

[12] President of the United States, <u>The National Security Strategy of the United States, 1994</u>, (Washington D.C.: The White House, July 1994) 7.

[13] Hirschfeld, Thomas J., <u>The Declining Threat to U.S. Interests</u>, (Santa Monica, CA: Rand Corporation, 1993) 7.

[14] U.S. Army, <u>The United States Army Posture Statement FY94</u>. (Washington D.C.: Department of the Army, March 1994) 20.

[15] Clausewitz, Carl Von, <u>On War</u>, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1976) 75.

[16] Griffin, Gary B., "Future Foes, Future Fights," <u>Military Review</u>, November 1994, 59. Colonel Griffin puts it like this: "A simple review of the developmental trends of future forces results in a near infinite number of possible future war scenarios -- all equally plausible -- capable of existing simultaneously in a single geographic region."

[17] U.S. Army. <u>Force XXI...America's Army of the 21st Century</u>, (Washington D.C.: Department of the Army, January 1995) 22.

[18] Ibid. 6.

[19] Colonel Boyd's OODA (Observe, Orient, Decide, Act) Loop referenced in Jeffrey R. Cooper, "Dominant Battlespace Awareness'" an unpublished paper dated 12 December 1994. Also see Lind, William S. <u>Maneuver Warfare Handbook</u>, (New York: Westview Press, 1985) 5.

[20] U.S. Army. <u>Force XXI...America's Army of the 21st Century</u>, (Washington D.C.: Department of the Army, January 1995) 8.

[21] The term "battle stance" is attributed to General (Ret) Richard Cavazos. As a senior observer for the Army's Battle Command Training Program (BCTP) General Cavazos suggests that while there is no doctrinal term for it, a military force must avoid putting itself in a position where it cannot adequately respond to the inevitable chaos and friction

that is war. Positioning of engineer assets in the formation in order that they might be capable of moving forward rapidly in the event of obstacles, or leap frogging artillery and ADA units are examples of maintaining a sound "battle stance." From an interview with General Cavazos conducted by the author in March 1995.

[22] Miller, John E., "Battlefield Framework White Paper," (Fort Leavenworth, KS: U.S. Army Command and General Staff College, June 1994) 1.

[23] Sun Tzu, The Art of War, trans. Samuel B. Griffith (London: Oxford University Press, 1963) 84.

[24] Cushman, John H., Thoughts for Joint Commanders, (Annapolis, MD: Whitmore Printing, 1993) 10.

[25] Janes C3I Systems 1993-1994, ed. Peter Rackham, (Coulsdon: Janes Information Group, 1993) 81.

[26] Laughridge, Gene, Knowing What to Know: Recent and Not so Recent Thinking on Information Operations and The Knowledge War, (an unpublished paper) 10.

[27] Ibid., 1.

[28] Barr, Avron and Edward Feigenbaum, The Handbook of Artificial Intelligence, (Reading, MA: Addison-Wesley Publishing Company Incorporated, 1981) 144.

[29] Brown. Tom, "Think in Reverse," Industry Week, July 1993, 14.

[30] Davidow, William H. and Michael S. Malone. The Virtual Corporation, (New York: HarperBusiness, 1992) 5-19, 162-165, 244-245.

[31] Keaney, Thomas A. and Eliot A. Cohen, Gulf War Air Power Survey Summary Report, (Washington, DC: Government Printing Office, 1993) 247-248.

[32] Ibid.

[33] Van Creveld, Martin L., Command in War, (Cambridge, MA: Harvard University Press, 1985) 274.

[34] Cooper, Jeffrey R, Dominant Battlespace Awareness, 12 Dec 1994.

[35] Otis, Glenn and Dr Cherry, "Concept Paper: Information Campaigns," (Vector Research Incorporated, 1991) 1-2.

[36] Schneider, James J., "The Theory of the Empty Battlefield." JRUSI, September 1987, 37-44.

[37] Arquilla, John and David Renfeldt, "Cyberwar is Coming!" (Santa Monica, CA: Rand Corporation, 1992) 25.

[38] Otis and Cherry, 1-1,1-2.

[39] Ibid., 1-5.

[40] Cooper, 8.

[43] Ibid., 9.

[42] Ibid., 8.

[43] TRADOC Pamphlet 525-5, August 1994, 2-8. Internetted organizations are posed in contrast to a strictly hierarchical command information structure where every organization reports to one and only one higher with limited if any peer connectivity. A nonhierarchical structure does not imply any one specific reporting procedure. It implies that there will be times when bypassing layers in the hierarchy is important if not essential. In addition, peer to peer contact and other unorthodox communications links are encouraged to improve productivity of the organization as a whole.

[44] Joint Pub 5.0 and Joint Pub 5-00.1 Revised Initial Draft Aug 93 both address this subject. Mr. Mike Morin at the U.S. Army War College and LTC Desosa at TRADOC are currently updating a December 1994 Draft of 5-00.1 that updates the Campaign Model found in the 1974 edition of JCS Pub 2 Unified Action Armed Forces (UNAAF). One might recall that the 1986 edition of JCS Pub 2 eliminated this section on campaign planning. In addition, a historical perspective on the relationship between campaign planning and Joint Operations Planning is provided in a study performed at the U.S. Army War College entitled Campaign Planning published in January 1988.

[45] Cooper, 7.

[46] Gabel, The U.S. Army GHQ Maneuvers of 1941, (Washington, DC: Government Printing Office, 1991) 29.

[47] The increase in operational tempo associated with KBO will induce a similar challenge for commanders in the 21st century, that MacMillan alluded to concerning the advent of mechanized warfare in World War II. From a conversation with LTC Charles Hammond, April 1995.